

Search Plan and Results

Question

What is the relationship between eating frequency and body weight? (DGAC 2010)

Date Searched

12/23/2009

Inclusion Criteria

- January 2000 to present
- Systematic reviews and meta-analysis, RCT or clinical controlled studies, large non-randomized observational studies, cohort, case-control studies
- Human subjects
- The sample size must equal 10 adults for each study group. For example, this would include 10 patients in the intervention group and 10 patients in the control or comparison group.
- Less than 20%; preference for smaller dropout rates
- English language
- International
- *Ages:* Children under age 18 years; adults 19 years and older
- *Populations:* Healthy and those with elevated chronic disease risk; people with history of polyps adenomatous, adenoma or adenocarcinoma.

Exclusion Criteria

- Medical treatment or therapy
- Cross-sectional studies
- Narrative reviews, cross-sectional studies
- Diseased subjects (already diagnosed with disease related to study purpose)
- Hospitalized patients
- Malnourished or third-world populations or disease incidence not relative to US population (e.g., malaria)
- Animal studies
- In vitro studies
- Articles not peer reviewed (websites, magazine articles, Federal reports, etc.).

Search Terms: Search Vocabulary

(“meal frequency” OR “eating frequency” OR “meal times” OR “meal timing” OR “dinner frequency” OR (eating occasion*) OR meal occasion*) AND (“body weight”[mh] OR adiposity[mh] OR “Body Mass Index”[mh] OR “Overweight”[mh] OR “Obesity”[mh] OR “Waist-Hip Ratio”[Mesh]) AND eating[mh]

("meal frequency" OR "eating frequency" OR "meal times" OR "meal timing" OR "lunch frequency" (phrase not found in PubMed) OR "dinner frequency" OR (eating occasion*)) OR (eating pattern*) OR (meal pattern*)) AND ("body weight"[majr] OR adiposity[mh] OR "Body Mass Index"[majr] OR "Overweight"[majr] OR "Obesity"[majr] OR "Waist-Hip Ratio"[majr])

("feeding behavior"[mh] OR "caloric intake" OR "energy intake"[mh]) OR grazing OR nibbling)

Electronic Databases

PubMed.

Total hits from all electronic database searches: 453

Total articles identified to review from electronic databases: 127

Articles Identified Via Handsearch or Other Means

Summary of Articles Identified to Review

Number of Primary Articles Identified: 2

Number of Review Articles Identified: 0

Total Number of Articles Identified: 2

Number of Articles Reviewed but Excluded: 125

List of Articles Included for Evidence Analysis

Children

Cohort Studies

Franko DL, Striegel-Moore RH, Thompson D, Affenito SG, Schreiber GB, Daniels SR, Crawford PB. [The relationship between meal frequency and body mass index in black and white adolescent girls: more is less.](#) *Int J Obes (Lond)*. 2008 Jan; 32(1): 23-29. Epub 2007 Jun 12. PMID: 17563764.

Adults

Cohort Studies

van der Heijden AA, Hu FB, Rimm EB, van Dam RM. [A prospective study of breakfast consumption and weight gain among U.S. men.](#) *Obesity (Silver Spring)*. 2007 Oct; 15(10): 2, 463-2, 469. PMID: 17925472.

List of Excluded Articles with Reason

Article (A-G)	Reason for Exclusion
Amosa T, Rush E, Plank L. Frequency of eating occasions reported by young New Zealand Polynesian and European women. <i>Pac Health Dialog</i> . 2001 Mar; 8(1): 59-65. PMID: 12017838.	Study design is cross-sectional.
Andersson I, Lennernäs M, Rössner S. Meal pattern and risk factor evaluation in one-year completers of a weight reduction program for obese men: The 'Gustaf study.' <i>J Intern Med</i> . 2000 Jan; 247(1): 30-38. PMID: 10672128.	Did not answer question; examined the effect of snacking quality on weight.
Ariza AJ, Chen EH, Binns HJ, Christoffel KK. Risk factors for overweight in five- to six-year-old Hispanic-American children: A pilot study. <i>J Urban Health</i> . 2004 Mar; 81(1): 150-161. PMID: 15047793.	Study design is cross-sectional.
Azizi F, Allahverdian S, Mirmiran P, Rahmani M, Mohammadi F. Dietary factors and body mass index in a group of Iranian adolescents: Tehran lipid and glucose study--2. <i>Int J Vitam Nutr Res</i> . 2001 Mar; 71(2): 123-127. PMID: 11339109.	Study population not from a developed country as defined by the Human Development Index (2010); study design is cross-sectional.
Barba G, Troiano E, Russo P, Siani A; ARCA Project Study group. Total fat, fat distribution and blood pressure according to eating frequency in children living in southern Italy: The ARCA project. <i>Int J Obes (Lond)</i> . 2006 Jul; 30(7): 1, 166-1, 169. Epub 2006 Feb 7. PMID: 16462817.	Study design is cross-sectional.
Berg C, Lappas G, Wolk A, Strandhagen E, Torén K, Rosengren A, Thelle D, Lissner L. Eating patterns and portion size associated with obesity in a Swedish population. <i>Appetite</i> . 2009 Feb; 52(1): 21-26. Epub 2008 Jul 25. PMID: 18694791.	Study design is cross-sectional.

<p>Bertéus Forslund H, Klingström S, Hagberg H, Löndahl M, Torgerson JS, Lindroos AK. Should snacks be recommended in obesity treatment? A 1-year randomized clinical trial. <i>Eur J Clin Nutr</i>. 2008 Nov; 62(11): 1, 308-1, 317. Epub 2007 Aug 15. PMID: 17700649.</p>	<p>Did not answer question; examined eating frequency as a tool for active weight loss.</p>
<p>Bertéus Forslund H, LindroosAK, Sjöström L, Lissner L. Meal patterns and obesity in Swedish women-a simple instrument describing usual meal types, frequency and temporal distribution. <i>Eur J Clin Nutr</i>. 2002 Aug; 56(8): 740-747. PMID: 12122550.</p>	<p>Study design is cross-sectional.</p>
<p>Bertéus Forslund H, Torgerson JS, Sjöström L, LindroosAK. Snacking frequency in relation to energy intake and food choices in obese men and women compared to a reference population. <i>Int J Obes (Lond)</i>. 2005 Jun; 29(6): 711-719. PMID: 15809664.</p>	<p>Study design is cross-sectional.</p>
<p>Bes-Rastrollo M, Sánchez-Villegas A, Gómez-Gracia E, Martínez JA, Pajares RM, Martínez-González MA. Predictors of weight gain in a Mediterranean cohort: The Seguimiento Universidad de Navarra Study 1. <i>Am J Clin Nutr</i>. 2006 Feb; 83(2): 362-370; quiz 394-395. PMID: 16469996.</p>	<p>Study did not assess eating frequency.</p>
<p>Bilyk MC, Sontrop JM, Chapman GE, Barr SI, Mamer L. Food experiences and eating patterns of visually impaired and blind people. <i>Can J Diet Pract Res</i>. 2009 Spring; 70(1): 13-18. PMID: 19261202.</p>	<p>Study design is cross-sectional; does not answer question; did not examine relationship between eating frequency and weight.</p>
<p>bin Zaal AA, Musaiger AO, D'Souza R. Dietary habits associated with obesity among adolescents in Dubai, United Arab Emirates. <i>Nutr Hosp</i>. 2009 Jul-Aug; 24(4): 437-444. PMID: 19721923.</p>	<p>Study design is cross-sectional.</p>
<p>Blass EM, Anderson DR, Kirkorian HL, Pempek TA, Price I, Koleini MF. On the road to obesity: Television viewing increases intake of high-density foods. <i>Physiol Behav</i>. 2006 Jul 30; 88(4-5): 597-604. Epub 2006 Jul 5. PMID: 16822530.</p>	<p>Study did not assess eating frequency; does not include weight in analyses.</p>
<p>Booth DA. Evidence-based reduction of obesity: Identification of a subculture's least fattening eating patterns. <i>Appetite</i>. 1999 Feb; 32(1): 80-85. PMID: 9989917.</p>	<p>Study design is a narrative review.</p>

<p>Bove CF, Olson CM. Obesity in low-income rural women: qualitative insights about physical activity and eating patterns. <i>Women Health</i>. 2006; 44(1): 57-78. PMID: 17182527.</p>	<p>Does not include weight in analyses.</p>
<p>Briefel RR, Wilson A, Gleason PM. Consumption of low-nutrient, energy-dense foods and beverages at school, home, and other locations among school lunch participants and nonparticipants. <i>J Am Diet Assoc</i>. 2009 Feb; 109(2 Suppl): S79-S90. PMID: 19166676.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Burgmer R, Grigutsch K, Zipfel S, Wolf AM, de Zwaan M, Husemann B, Albus C, Senf W, Herpertz S. The influence of eating behavior and eating pathology on weight loss after gastric restriction operations. <i>Obes Surg</i>. 2005 May; 15(5): 684-691. PMID: 15946461.</p>	<p>Participants underwent gastric bypass surgery.</p>
<p>Burrows T, Warren JM, Baur LA, Collins CE. Impact of a child obesity intervention on dietary intake and behaviors. <i>Int J Obes (Lond)</i>. 2008 Oct; 32(10): 1, 481-1, 488. Epub 2008 Jul 8. PMID: 18607380</p>	<p>Does not include eating frequency in analyses.</p>
<p>Burton P, Smit HJ, Lightowler HJ. The influence of restrained and external eating patterns on overeating. <i>Appetite</i>. 2007 Jul; 49(1): 191-197. Epub 2007 Feb 11. PMID: 17349717.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Carels RA, Young KM, Coit C, Clayton AM, Spencer A, Wagner M. Skipping meals and alcohol consumption. The regulation of energy intake and expenditure among weight loss participants. <i>Appetite</i>. 2008 Nov; 51(3): 538-545. Epub 2008 Apr 15. PMID: 18511146.</p>	<p>Did not answer question; examined eating frequency as a tool for active weight loss.</p>
<p>Castellanos VH, Marra MV, Johnson P. Enhancement of select foods at breakfast and lunch increases energy intakes of nursing home residents with low meal intakes. <i>J Am Diet Assoc</i>. 2009 Mar; 109(3): 445-451. PMID: 19248860.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Colles SL, Dixon JB, O'Brien PE. Grazing and loss of control related to eating: Two high-risk factors following bariatric surgery. <i>Obesity (Silver Spring)</i>. 2008 Mar; 16(3): 615-622. Epub 2008 Jan 17. PMID: 18239603.</p>	<p>Participants underwent gastric bypass surgery.</p>
<p>Davis B, Carpenter C. Proximity of fast-food restaurants to schools and adolescent obesity. <i>Am J Public Health</i>. 2009 Mar; 99(3): 505-510. Epub 2008 Dec 23. PMID: 19106421.</p>	<p>Does not include eating frequency in analyses.</p>

<p>Downs SM, Arnold A, Marshall D, McCargar LJ, Raine KD, Willows ND. Associations among the food environment, diet quality and weight status in Cree children in Québec. <i>Public Health Nutr.</i> 2009 Sep; 12(9): 1, 504-1, 511. Epub 2009 Jan 15. PMID: 19144239.</p>	<p>Study design is cross-sectional.</p>
<p>Drapeau V, Després JP, Bouchard C, Allard L, Fournier G, Leblanc C, Tremblay A. Modifications in food-group consumption are related to long-term body-weight changes. <i>Am J Clin Nutr.</i> 2004 Jul; 80(1): 29-37. PMID: 15213024.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Dubois L, Farmer A, Girard M, Peterson K. Social factors and television use during meals and snacks is associated with higher BMI among pre-school children. <i>Public Health Nutr.</i> 2008 Dec; 11(12): 1, 267-1, 279. Epub 2008 Jun 12. PMID: 18547454.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Dubois L, Girard M, Potvin Kent M, Farmer A, Tatone-Tokuda F. Breakfast skipping is associated with differences in meal patterns, macronutrient intakes and overweight among pre-school children. <i>Public Health Nutr.</i> 2009 Jan; 12(1): 19-28. Epub 2008 Mar 18. PMID: 18346309.</p>	<p>Does not answer question; examined relationship between breakfast frequency and weight.</p>
<p>Duncan JS, Schofield G, Duncan EK, Rush EC. Risk factors for excess body fatness in New Zealand children. <i>AsiaPac J Clin Nutr.</i> 2008; 17(1): 138-147. PMID: 18364339.</p>	<p>Study design is cross-sectional.</p>
<p>Duval K, Strychar I, Cyr MJ, Prud'homme D, Rabasa-Lhoret R, Doucet E. Physical activity is a confounding factor of the relation between eating frequency and body composition. <i>Am J Clin Nutr.</i> 2008 Nov; 88(5): 1, 200-1, 205. PMID: 18996853.</p>	<p>Study design is cross-sectional.</p>
<p>Dwyer JT, Evans M, Stone EJ, Feldman HA, Lytle L, Hoelscher D, Johnson C, Zive M, Yang M; Child and Adolescent Trial for Cardiovascular Health (CATCH) Cooperative Research Group. Adolescents' eating patterns influence their nutrient intakes. <i>J Am Diet Assoc.</i> 2001 Jul; 101(7): 798-802. No abstract available. PMID: 11478479.</p>	<p>Does not include weight in analyses.</p>
<p>Epstein LH, Robinson JL, Temple JL, Roemmich JN, Marusewski AL, Nadbrzuch RL. Variety influences habituation of motivated behavior for food and energy intake in children. <i>Am J Clin Nutr.</i> 2009 Mar; 89(3): 746-754. Epub 2009 Jan 28. PMID: 19176724.</p>	<p>Does not include eating frequency in analyses.</p>

Faith MS, Keller KL, Johnson SL, Pietrobelli A, Matz PE, Must S, Jorge MA, Cooperberg J, Heymsfield SB, Allison DB. Familial aggregation of energy intake in children . <i>Am J Clin Nutr.</i> 2004 May; 79(5): 844-850. PMID: 15113724.	Does not include eating frequency in analyses.
Farshchi HR, Taylor MA, Macdonald IA. Beneficial metabolic effects of regular meal frequency on dietary thermogenesis, insulin sensitivity, and fasting lipid profiles in healthy obese women . <i>Am J Clin Nutr.</i> 2005 Jan; 81(1): 16-24. PMID: 15640455.	Does not include weight in analyses.
Fisher JO, Arreola A, Birch LL, Rolls BJ. Portion size effects on daily energy intake in low-income Hispanic and African American children and their mothers . <i>Am J Clin Nutr.</i> 2007 Dec; 86(6): 1, 709-1, 716. PMID: 18065590.	Does not answer question; did not examine relationship between eating frequency and weight.
Fogteloo AJ, Pijl H, Roelfsema F, Frölich M, Meinders AE. Impact of meal timing and frequency on the twenty-four-hour leptin rhythm . <i>Horm Res.</i> 2004; 62(2): 71-78. Epub 2004 Jun 21. PMID: 15218336.	Does not include weight in analyses.
Fox MK, Gordon A, Nogales R, Wilson A. Availability and consumption of competitive foods in US public schools . <i>J Am Diet Assoc.</i> 2009 Feb; 109(2 Suppl): S57-S66. PMID: 19166673.	Does not answer question; did not examine relationship between eating frequency and weight; study design is cross-sectional.
Francis LA, Birch LL. Does eating during television viewing affect preschool children's intake? <i>J Am Diet Assoc.</i> 2006 Apr; 106(4): 598-600. PMID: 16567158.	Does not answer question; did not examine relationship between eating frequency and weight.
Frecka JM, Mattes RD. Possible entrainment of ghrelin to habitual meal patterns in humans . <i>Am J Physiol Gastrointest Liver Physiol.</i> 2008 Mar; 294(3): G699-G707. Epub 2008 Jan 10. PMID: 18187517.	Does not include weight in analyses.
Fulkerson JA, Neumark-Sztainer D, Hannan PJ, Story M. Family meal frequency and weight status among adolescents: Cross-sectional and 5-year longitudinal associations . <i>Obesity (Silver Spring)</i> . 2008 Nov; 16(11): 2, 529-2, 534. Epub 2008 Aug 14. PMID: 18719674.	Does not include eating frequency in analyses.
Gleason PM, Dodd AH. School breakfast program but not school lunch program participation is associated with lower body mass index . <i>J Am Diet Assoc.</i> 2009 Feb; 109(2 Suppl): S118-S128. PMID: 19166666.	Does not include eating frequency in analyses; study design is cross-sectional .

Article (H-R)	Reason for Exclusion
<p>Haire-Joshu D, Nanney MS. Prevention of overweight and obesity in children: Influences on the food environment. <i>Diabetes Educ.</i> 2002 May-Jun; 28(3): 415-423. PMID: 12068650.</p>	<p>Study design is a narrative review.</p>
<p>Haug E, Rasmussen M, Samdal O, Iannotti R, Kelly C, Borraccino A, Vereecken C, Melkevik O, Lazzeri G, Giacchi M, Ercan O, Due P, Ravens-Sieberer U, Currie C, Morgan A, Ahluwalia N; HBSCObesity Writing Group. Overweight in school-aged children and its relationship with demographic and lifestyle factors: Results from the WHO-Collaborative Health Behaviour in School-aged Children (HBSC) study. <i>Int J Public Health.</i> 2009 Sep; 54 Suppl 2: 167-179. PMID: 19618111.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Hise ME, Sullivan DK, Jacobsen DJ, Johnson SL, Donnelly JE. Validation of energy intake measurements determined from observer-recorded food records and recall methods compared with the doubly labeled water method in overweight and obese individuals. <i>Am J Clin Nutr.</i> 2002 Feb; 75(2): 263-267. PMID: 11815316.</p>	<p>Does not answer question; did not examine relationship between eating frequency and weight.</p>
<p>Hopkins S, Burrows E, Bowen DJ, Tinker LF. Differences in eating pattern labels between maintainers and nonmaintainers in the Women's Health Initiative. <i>J Nutr Educ.</i> 2001 Sep-Oct; 33(5): 278-283. PMID: 12031178.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Howard BV, Manson JE, Stefanick ML, Beresford SA, Frank G, Jones B, Rodabough RJ, Snetelselaar L, Thomson C, Tinker L, Vitolins M, Prentice R. Low-fat dietary pattern and weight change over 7 years: The Women's Health Initiative Dietary Modification Trial. <i>JAMA.</i> 2006 Jan 4; 295(1): 39-49. PMID: 16391215.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Howarth NC, Huang TT, Roberts SB, Lin BH, McCrory MA. Eating patterns and dietary composition in relation to BMI in younger and older adults. <i>Int J Obes (Lond).</i> 2007 Apr; 31(4): 675-684. Epub 2006 Sep 5. PMID: 16953255.</p>	<p>Study design is cross-sectional.</p>
<p>Huang TT, HowarthNC, Lin BH, Roberts SB, McCrory MA. Energy intake and meal portions: Associations with BMI percentile in U.S. children. <i>Obes Res.</i> 2004 Nov; 12(11): 1, 875-1, 885. PMID: 15601985.</p>	<p>Study design is cross-sectional.</p>
<p>Hörchner R, Tuinebreijer W, Kelder H. Eating patterns in morbidly obese patients before and after a gastric restrictive operation. <i>Obes Surg.</i> 2002 Feb; 12(1): 108-112. PMID: 11868285.</p>	<p>Participants underwent gastric bypass surgery.</p>

<p>Jehn ML, Gittelsohn J, Treuth MS, Caballero B. Prevalence of overweight among Baltimore City schoolchildren and its associations with nutrition and physical activity. <i>Obesity (Silver Spring)</i>. 2006 Jun; 14(6): 989-993. PMID: 16861603.</p>	<p>Study design is cross-sectional.</p>
<p>Julis RA, Mattes RD. Influence of sweetened chewing gum on appetite, meal patterning and energy intake. <i>Appetite</i>. 2007 Mar; 48(2): 167-175. Epub 2006 Oct 13. PMID: 17050036.</p>	<p>Does not answer question; did not examine relationship between eating frequency and weight.</p>
<p>Kant AK, Graubard BI. Eating out in America, 1987-2000: trends and nutritional correlates. <i>Prev Med</i>. 2004 Feb; 38(2): 243-249. PMID: 14715218.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Keski-Rahkonen A, Bulik CM, Pietiläinen KH, Rose RJ, Kaprio J, Rissanen A. Eating styles, overweight and obesity in young adult twins. <i>Eur J Clin Nutr</i>. 2007 Jul; 61(7): 822-829. Epub 2007 Jan 24. PMID: 17251930.</p>	<p>Study design is cross-sectional.</p>
<p>Kim HY, Frongillo EA, Han SS, Oh SY, Kim WK, Jang YA, Won HS, Lee HS, Kim SH. Academic performance of Korean children is associated with dietary behaviours and physical status. <i>AsiaPac J Clin Nutr</i>. 2003; 12(2): 186-192. PMID: 12810409.</p>	<p>Does not include weight in analyses; study design is cross-sectional.</p>
<p>Kral JG, Buckley MC, Kissileff HR, Schaffner F. Metabolic correlates of eating behavior in severe obesity. <i>Int J Obes Relat Metab Disord</i>. 2001 Feb; 25(2): 258-264. PMID: 11410829.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Kristal AR, Curry SJ, Shattuck AL, Feng Z, Li S. A randomized trial of a tailored, self-help dietary intervention: The Puget Sound Eating Patterns study. <i>Prev Med</i>. 2000 Oct; 31(4): 380-389. PMID: 11006063.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Liebman M, Pelican S, Moore SA, Holmes B, Wardlaw MK, Melcher LM, Liddil AC, Paul LC, Dunnagan T, Haynes GW. Dietary intake, eating behavior, and physical activity-related determinants of high body mass index in rural communities in Wyoming, Montana, and Idaho. <i>Int J Obes Relat Metab Disord</i>. 2003 Jun; 27(6): 684-692. PMID: 12833112.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Lioret S, Touvier M, Lafay L, Volatier JL, Maire B. Are eating occasions and their energy content related to child overweight and socioeconomic status? <i>Obesity (Silver Spring)</i>. 2008 Nov; 16(11): 2, 518-2, 523. Epub 2008 Sep 4. PMID: 18772863.</p>	<p>Study design is cross-sectional.</p>

<p>Lioret S, Volatier JL, Lafay L, Touvier M, Maire B. Is food portion size a risk factor of childhood overweight? <i>Eur J Clin Nutr.</i> 2009 Mar; 63(3): 382-391. Epub 2007 Nov 21. PMID: 18030311.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Lluch A, Herbeth B, Méjean L, Siest G. Dietary intakes, eating style and overweight in the Stanislas Family Study. <i>Int J Obes Relat Metab Disord.</i> 2000 Nov; 24(11): 1, 493-1, 499. PMID: 11126347.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Ma Y, Bertone ER, Stanek EJ 3rd, Reed GW, Hebert JR, Cohen NL, Merriam PA, Ockene IS. Association between eating patterns and obesity in a free-living US adult population. <i>Am J Epidemiol.</i> 2003 Jul 1; 158(1): 85-92. PMID: 12835290.</p>	<p>Study design is cross-sectional.</p>
<p>Marín-Guerrero AC, Gutiérrez-Fisac JL, Guallar-Castillón P, Banegas JR, Rodríguez-Artalejo F. Eating behaviours and obesity in the adult population of Spain. <i>Br J Nutr.</i> 2008 Nov; 100(5): 1, 142-1, 148. Epub 2008 Apr 1. PMID: 18377684.</p>	<p>Study design is cross-sectional.</p>
<p>Masheb RM, Grilo CM. Eating patterns and breakfast consumption in obese patients with binge eating disorder. <i>Behav Res Ther.</i> 2006 Nov; 44(11): 1, 545-1, 553. Epub 2005 Dec 22. PMID: 16376851.</p>	<p>Study design is cross-sectional; participants diagnosed with binge-eating disorder.</p>
<p>Mattes RD, CampbellWW. Effects of food form and timing of ingestion on appetite and energy intake in lean young adults and in young adults with obesity. <i>J Am Diet Assoc.</i> 2009 Mar; 109(3): 430-437. PMID: 19248858.</p>	<p>Does not include weight in analyses.</p>
<p>Mattes RD. Food palatability, rheology, and meal patterning. <i>J Parenter Enteral Nutr.</i> 2008 Sep-Oct; 32(5): 572-574. PMID: 18753396.</p>	<p>Study is a narrative review.</p>
<p>Mattson MP. The need for controlled studies of the effects of meal frequency on health. <i>Lancet.</i> 2005 Jun 4-10; 365(9, 475): 1, 978-1, 980. No abstract available. PMID: 15936428.</p>	<p>Study is a commentary.</p>
<p>McCaffree J. Childhood eating patterns: The roles parents play. <i>J Am Diet Assoc.</i> 2003 Dec; 103(12): 1, 587. No abstract available. PMID: 14647078.</p>	<p>Study is a commentary/narrative review.</p>
<p>McConahy KL, Smiciklas-Wright H, Birch LL, Mitchell DC, Picciano MF. Food portions are positively related to energy intake and body weight in early childhood. <i>J Pediatr.</i> 2002 Mar; 140(3): 340-347. PMID: 11953733</p>	<p>Study design is cross-sectional.</p>

<p>McKiernan F, Hollis JH, Mattes RD. Short-term dietary compensation in free-living adults. <i>Physiol Behav</i>. 2008 Mar 18; 93(4-5): 975-983. Epub 2007 Dec 26. PMID: 18261752.</p>	<p>Does not include weight in analyses.</p>
<p>Mendoza J, Drevet K, Pévet P, Challet E. Daily meal timing is not necessary for resetting the main circadian clock by calorie restriction. <i>J Neuroendocrinol</i>. 2008 Feb; 20(2): 251-260. Epub 2007 Dec 7. PMID: 18088363.</p>	<p>Study subjects are rats.</p>
<p>Mohindra NA, Nicklas TA, O'Neil CE, Yang SJ, Berenson GS. Eating patterns and overweight status in young adults: the Bogalusa Heart Study. <i>Int J Food Sci Nutr</i>. 2009; 60 Suppl 3: 14-25. Epub 2009 May 21. PMID: 19462322.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Mossavar-Rahmani Y, Henry H, Rodabough R, Bragg C, Brewer A, Freed T, Kinzel L, Pedersen M, Soule CO, Vosburg S. Additional self-monitoring tools in the dietary modification component of The Women's Health Initiative. <i>J Am Diet Assoc</i>. 2004 Jan; 104(1): 76-85. PMID: 14702588.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Mota J, Fidalgo F, Silva R, Ribeiro JC, SantosR, Carvalho J, Santos MP. Relationships between physical activity, obesity and meal frequency in adolescents. <i>Ann Hum Biol</i>. 2008 Jan-Feb; 35(1): 1-10. PMID: 18274921.</p>	<p>Study design is cross-sectional.</p>
<p>Neumark-Sztainer D, Story M, Hannan PJ, Perry CL, Irving LM. Weight-related concerns and behaviors among overweight and nonoverweight adolescents: Implications for preventing weight-related disorders. <i>Arch Pediatr Adolesc Med</i>. 2002 Feb; 156(2): 171-178. PMID: 11814380.</p>	<p>Study design is cross-sectional.</p>
<p>Newby PK, Weismayer C, Akesson A, Tucker KL, Wolk A. Longitudinal changes in food patterns predict changes in weight and body mass index and the effects are greatest in obese women. <i>J Nutr</i>. 2006 Oct; 136(10): 2, 580-2, 587. PMID: 16988130.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Nicklas TA, Demory-Luce D, Yang SJ, Baranowski T, Zakeri I, Berenson G. Children's food consumption patterns have changed over two decades (1973-1994): The Bogalusa heart study. <i>J Am Diet Assoc</i>. 2004 Jul; 104(7): 1, 127-1, 140. PMID: 15215772.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Nicklas TA, Morales M, Linares A, Yang SJ, Baranowski T, De Moor C, Berenson G. Children's meal patterns have changed over a 21-year period: The Bogalusa Heart Study. <i>J Am Diet Assoc</i>. 2004 May; 104(5): 753-761. PMID: 15127060.</p>	<p>Study design is cross-sectional.</p>

<p>Nicklas TA, Yang SJ, Baranowski T, Zakeri I, Berenson G. Eating patterns and obesity in children: The Bogalusa Heart Study. <i>Am J Prev Med.</i> 2003 Jul; 25(1): 9-16. PMID: 12818304.</p>	<p>Study design is cross-sectional.</p>
<p>Ovaskainen ML, Reini vu H, Tapanainen H, Hannila ML, Korhonen T, Pakkala H. Snacks as an element of energy intake and food consumption. <i>Eur J Clin Nutr.</i> 2006 Apr; 60(4): 494-501. PMID: 16319836.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Pawlow LA, O'Neil PM, Malcolm RJ. Night eating syndrome: Effects of brief relaxation training on stress, mood, hunger, and eating patterns. <i>Int J Obes Relat Metab Disord.</i> 2003 Aug; 27(8): 970-978. PMID: 12861239.</p>	<p>Does not include weight in analyses.</p>
<p>Pearcey SM, de Castro JM. Food intake and meal patterns of weight-stable and weight-gaining persons. <i>Am J Clin Nutr.</i> 2002 Jul; 76(1): 107-112. PMID: 12081823.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Pérez A, Hoelscher DM, Brown HS 3rd, Kelder SH. Differences in food consumption and meal patterns in Texas school children by grade. <i>Prev Chronic Dis.</i> 2007 Apr; 4(2): A23. Epub 2007 Mar 15. PMID: 17362614.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Pomerleau CS, Saules K. Body image, body satisfaction, and eating patterns in normal-weight and overweight/obese women current smokers and never-smokers. <i>Addict Behav.</i> 2007 Oct; 32(10): 2, 329-2, 334. Epub 2007 Jan 23. PMID: 17320305.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Popkin BM, Barclay DV, Nielsen SJ. Water and food consumption patterns of U.S. adults from 1999 to 2001. <i>Obes Res.</i> 2005 Dec; 13(12): 2, 146-2, 152. PMID: 16421349.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Prochnik Estima Cde C, da Costa RS, Sichieri R, Pereira RA, da Veiga GV. Meal consumption patterns and anthropometric measurements in adolescents from a low socioeconomic neighborhood in the metropolitan area of Rio de Janeiro, Brazil. <i>Appetite.</i> 2009 Jun; 52(3): 735-739. Epub 2009 Apr 5. PMID: 19501773.</p>	<p>Study design is cross-sectional.</p>
<p>Quatromoni PA, Copenhafer DL, D'Agostino RB, Millen BE. Dietary patterns predict the development of overweight in women: The Framingham Nutrition Studies. <i>J Am Diet Assoc.</i> 2002 Sep; 102(9): 1, 239-1, 246. PMID: 12792620.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Quatromoni PA, Pencina M, Cobain MR, Jacques PF, D'Agostino RB. Dietary quality predicts adult weight gain: findings from the Framingham Offspring Study. <i>Obesity (Silver Spring).</i> 2006 Aug; 14(8): 1, 383-1, 391. PMID: 16988081.</p>	<p>Does not include eating frequency in analyses.</p>

<p>Raynor HA, Jeffery RW, Ruggiero AM, Clark JM, Delahanty LM; Look AHEAD (Action for Health in Diabetes) Research Group. Weight loss strategies associated with BMI in overweight adults with type 2 diabetes at entry into the Look AHEAD (Action for Health in Diabetes) trial. <i>Diabetes Care</i>. 2008 Jul; 31(7): 1, 299-1, 304. Epub 2008 Mar 28. PMID: 18375417.</p>	<p>Study design is cross-sectional; participants diagnosed with type 2 diabetes.</p>
<p>Roehrig M, Masheb RM, White MA, Grilo CM. Dieting frequency in obese patients with binge eating disorder: behavioral and metabolic correlates. <i>Obesity (Silver Spring)</i>. 2009 Apr; 17(4): 689-697. Epub 2009 Jan 22. PMID: 19165172.</p>	<p>Does not answer question; did not examine relationship between eating frequency and weight; study design is cross-sectional.</p>
<p>Rousset S, Patureau Mirand P, Brandolini M, Martin JF, Boirie Y. Daily protein intakes and eating patterns in young and elderly French. <i>Br J Nutr</i>. 2003 Dec; 90(6): 1, 107-1, 115. PMID: 14641970.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Ruidavets JB, Bongard V, Bataille V, Gourdy P, Ferrières J. Eating frequency and body fatness in middle-aged men. <i>Int J Obes Relat Metab Disord</i>. 2002 Nov; 26(11): 1, 476-1, 483. PMID: 12439650.</p>	<p>Study design is cross-sectional.</p>

Article (S-Z)	Reason for Exclusion
<p>Saarilehto S, Lapinleimu H, Keskinen S, Helenius H, Talvia S, Simell O. Growth, energy intake, and meal pattern in five-year-old children considered as poor eaters. <i>J Pediatr</i>. 2004 Mar; 144(3): 363-367. PMID: 15001944.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Santana P, Santos R, Nogueira H. The link between local environment and obesity: a multilevel analysis in the Lisbon Metropolitan Area, Portugal. <i>Soc Sci Med</i>. 2009 Feb; 68(4): 601-609. Epub 2009 Jan 8. PMID: 19135287.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Saunders R. "Grazing": a high-risk behavior. <i>Obes Surg</i>. 2004 Jan; 14(1): 98-102. PMID: 14980042.</p>	<p>Participants underwent gastric bypass surgery.</p>
<p>Schwartz J, Byrd-Bredbenner C. Portion distortion: typical portion sizes selected by young adults. <i>J Am Diet Assoc</i>. 2006 Sep; 106(9): 1, 412-1, 418. PMID: 16963346.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>

<p>Scully M, Dixon H, Wakefield M. Association between commercial television exposure and fast-food consumption among adults. <i>Public Health Nutr.</i> 2009 Jan; 12(1):105-110. Epub 2008 Mar 14. PMID: 18339226.</p>	<p>Does not answer question; did not examine relationship between eating frequency and weight; study design is cross-sectional.</p>
<p>Shrewsbury VA, O'Connor J, Steinbeck KS, Stevenson K, Lee A, Hill AJ, Kohn MR, Shah S, Torvaldsen S, Baur LA. A randomised controlled trial of a community-based healthy lifestyle program for overweight and obese adolescents: the Loozit study protocol. <i>BMC Public Health.</i> 2009 Apr 29; 9: 119. PMID: 19402905.</p>	<p>Study reports trial methodology, not results.</p>
<p>Silver HJ, Dietrich MS, Castellanos VH. Increased energy density of the home-delivered lunch meal improves 24-hour nutrient intakes in older adults. <i>J Am Diet Assoc.</i> 2008 Dec; 108(12): 2, 084-2, 089. PMID: 19027413.</p>	<p>Does not answer question; did not examine relationship between eating frequency and weight.</p>
<p>Smeets AJ, Westerterp-Plantenga MS. Acute effects on metabolism and appetite profile of one meal difference in the lower range of meal frequency. <i>Br J Nutr.</i> 2008 Jun; 99(6): 1, 316-1, 321. Epub 2007 Dec 6. PMID: 18053311.</p>	<p>Does not include weight in analyses.</p>
<p>Striegel-Moore RH, Franko DL, Thompson D, Affenito S, May A, Kraemer HC. Exploring the typology of night eating syndrome. <i>Int J Eat Disord.</i> 2008 Jul; 41(5): 411-418. PMID: 18306340.</p>	<p>Study design is cross-sectional.</p>
<p>Stroebele N, de Castro JM. Television viewing is associated with an increase in meal frequency in humans. <i>Appetite.</i> 2004 Feb; 42(1): 111-113. PMID: 15036790.</p>	<p>Does not include weight in analyses.</p>
<p>Taylor MA, Garrow JS. Compared with nibbling, neither gorging nor a morning fast affect short-term energy balance in obese patients in a chamber calorimeter. <i>Int J Obes Relat Metab Disord.</i> 2001 Apr; 25(4): 519-528. PMID: 11319656.</p>	<p>Does not include weight in analyses.</p>
<p>Terry-McElrath YM, O'Malley PM, Delva J, Johnston LD. The school food environment and student body mass index and food consumption: 2004 to 2007 national data. <i>J Adolesc Health.</i> 2009 Sep; 45(3 Suppl): S45-S56. Epub 2009 Jun 24. PMID: 19699436.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Timlin MT, Pereira MA, Story M, Neumark-Sztainer D. Breakfast eating and weight change in a 5-year prospective analysis of adolescents: Project EAT (Eating Among Teens). <i>Pediatrics.</i> 2008 Mar; 121(3): e638-e645. PMID: 18310183.</p>	<p>Does not answer question; did not examine relationship between eating frequency and weight.</p>

<p>Toschke AM, Küchenhoff H, Koletzko B, von Kries R. <u>Meal frequency and childhood obesity</u>. <i>Obes Res.</i> 2005 Nov; 13(11): 1, 932-1, 938. PMID: 16339125.</p>	<p>Study design is cross-sectional.</p>
<p>Toschke AM, von Kries R, Beyerlein A, Rückinger S. <u>Risk factors for childhood obesity: Shift of the entire BMI distribution vs. shift of the upper tail only in a cross sectional study</u>. <i>BMC Public Health.</i> 2008 Apr 10; 8: 115. PMID: 18402677.</p>	<p>Study design is cross-sectional.</p>
<p>Toyoshima H, Masuoka N, Hashimoto S, Otsuka R, Sasaki S, Tamakoshi K, Yatsuya H. <u>Effect of the interaction between mental stress and eating pattern on body mass index gain in healthy Japanese male workers</u>. <i>J Epidemiol.</i> 2009; 19(2): 88-93. Epub 2009 Mar 6. Erratum in: <i>J Epidemiol.</i> 2009; 19(5): 273. PMID: 19265270.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Viner RM, Cole TJ. <u>Who changes body mass between adolescence and adulthood? Factors predicting change in BMI between 16 year and 30 years in the 1970 British Birth Cohort</u>. <i>Int J Obes (Lond).</i> 2006 Sep; 30(9): 1, 368-1, 374. Epub 2006 Mar 21. PMID: 16552412.</p>	<p>Does not include eating frequency in analyses.</p>
<p>Vue H, Degeneffe D, Reicks M. <u>Need states based on eating occasions experienced by midlife women</u>. <i>J Nutr Educ Behav.</i> 2008 Nov-Dec; 40(6): 378-384. PMID: 18984495.</p>	<p>Does not answer question; did not examine relationship between eating frequency and weight; study design is cross-sectional.</p>
<p>Vågstrand K, Barkeling B, Forslund HB, Elfag K, Linné Y, Rössner S, Lindroos AK. <u>Eating habits in relation to body fatness and gender in adolescents: Results from the 'SWEDES' study</u>. <i>Eur J Clin Nutr.</i> 2007 Apr; 61(4): 517-525. Epub 2006 Sep 27. PMID: 17006444.</p>	<p>Does not answer question; did not examine relationship between eating frequency and weight; study design is cross-sectional.</p>
<p>Wang Y, Li J, Caballero B. <u>Resemblance in dietary intakes between urban low-income African-American adolescents and their mothers: The healthy eating and active lifestyles from school to home for kids study</u>. <i>J Am Diet Assoc.</i> 2009 Jan; 109(1): 52-63. PMID: 19103323.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Wang Y, Tussing L, Odoms-Young A, Braunschweig C, Flay B, Hedeker D, Hellison D. <u>Obesity prevention in low socioeconomic status urban African-American adolescents: Study design and preliminary findings of the HEALTH-KIDS Study</u>. <i>Eur J Clin Nutr.</i> 2006 Jan; 60(1): 92-103. PMID: 16118646.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>

<p>Wansink B, Payne CR, Chandon P. Internal and external cues of meal cessation: the French paradox redux? <i>Obesity (Silver Spring)</i>. 2007 Dec; 15(12): 2, 920-2, 924. PMID: 18198299.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Weinrich SP, Priest J, Reynolds W, Godley PA, Tuckson W, Weinrich M. Body mass index and intake of selected foods in African American men. <i>Public Health Nurs</i>. 2007 May-Jun; 24(3): 217-229. PMID: 17456123.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Westenhoefer J. Establishing dietary habits during childhood for long-term weight control. <i>Ann Nutr Metab</i>. 2002; 46 Suppl 1: 18-23. Review. PMID: 12428077.</p>	<p>Study is a narrative review.</p>
<p>Westerterp-Plantenga MS, Goris AH, Meijer EP, Westerterp KR. Habitual meal frequency in relation to resting and activity-induced energy expenditure in human subjects: the role of fat-free mass. <i>Br J Nutr</i>. 2003 Sep; 90(3): 643-649. PMID: 13129471.</p>	<p>Study design is cross-sectional.</p>
<p>Woodruff SJ, Hanning RM. Associations between family dinner frequency and specific food behaviors among grade six, seven, and eight students from Ontario and Nova Scotia. <i>J Adolesc Health</i>. 2009 May; 44(5): 431-436. Epub 2009 Jan 9. PMID: 19380089.</p>	<p>Does not answer question; did not examine relationship between eating frequency and weight.</p>
<p>Woods SC, Schwartz MW, Baskin DG, Seeley RJ. Food intake and the regulation of body weight. <i>Annu Rev Psychol</i>. 2000; 51: 255-277. Review. PMID: 10751972.</p>	<p>Study is a narrative review/chapter.</p>
<p>Würbach A, Zellner K, Kromeyer-Hauschild K. Meal patterns among children and adolescents and their associations with weight status and parental characteristics. <i>Public Health Nutr</i>. 2009 Aug; 12(8): 1, 115-1, 121. Epub 2009 Feb 26. PMID: 19243677.</p>	<p>Study design is cross-sectional.</p>
<p>Yahia N, Achkar A, Abdallah A, Rizk S. Eating habits and obesity among Lebanese university students. <i>Nutr J</i>. 2008 Oct 30; 7: 32. PMID: 18973661.</p>	<p>Study design is cross-sectional.</p>
<p>Yang RJ, Wang EK, Hsieh YS, Chen MY. Irregular breakfast eating and health status among adolescents in Taiwan. <i>BMC Public Health</i>. 2006 Dec 7; 6: 295. PMID: 17150112.</p>	<p>Does not answer question; examined the relationship between breakfast frequency and weight; study design is cross-sectional.</p>
<p>Yannakoulia M, Melistas L, Solomou E, Yiannakouris N. Association of eating frequency with body fatness in pre- and postmenopausal women. <i>Obesity (Silver Spring)</i>. 2007 Jan; 15(1): 100-106. PMID: 17228037.</p>	<p>Study design is cross-sectional.</p>

<p>Yannakoulia M, Panagiotakos D, Pitsavos C, Skoumas Y, Stefanadis C. <u>Eating patterns may mediate the association between marital status, body mass index, and blood cholesterol levels in apparently healthy men and women from the ATTICA study</u>. <i>Soc Sci Med.</i> 2008 Jun; 66(11): 2, 230-2, 239. Epub 2008 Mar 10. PMID: 18329772.</p>	<p>Does not include eating frequency in analyses; study design is cross-sectional.</p>
<p>Yannakoulia M, Papanikolaou K, Hatzopoulou I, Efstatithiou E, Papoutsakis C, Dedoussis GV. <u>Association between family divorce and children's BMI and meal patterns: The GENDAI Study</u>. <i>Obesity (Silver Spring)</i>. 2008 Jun; 16(6): 1, 382-1, 387. Epub 2008 Mar 27. PMID: 18369339.</p>	<p>Study design is cross-sectional.</p>
<p>Zaveri S, Drummond S. <u>The effect of including a conventional snack (cereal bar) and a nonconventional snack (almonds) on hunger, eating frequency, dietary intake and body weight</u>. <i>J Hum Nutr Diet.</i> 2009 Oct; 22(5): 461-468. PMID: 19743983.</p>	<p>Did not answer question; examined eating frequency as a tool for active weight loss.</p>
<p>Zerva A, Nassis GP, Krekoukia M, Psarra G, Sidossis LS. <u>Effect of eating frequency on body composition in 9-11-year-old children</u>. <i>Int J Sports Med.</i> 2007 Mar; 28(3): 265-270. Epub 2006 Oct 6. PMID: 17024645.</p>	<p>Study design is cross-sectional.</p>